Machine Learning, Medicine, and Business

Sarah Davis
Oct. 7th 2020

Presentation Outline



1. About me
2. Intro to the field
3. Why I love what I do
4. Skills I use (basically daily)
5. Projects and experience
6. Relevant topics to Precision Health
7. Takeaways / Shoutouts

About me

- Sarah Davis
- UAlberta Computing Science MSc student studying medical AI
- BSc in BioSci w/ CS Minor
- AIMSS co-president





What is Medical Data Analysis?

Data Used

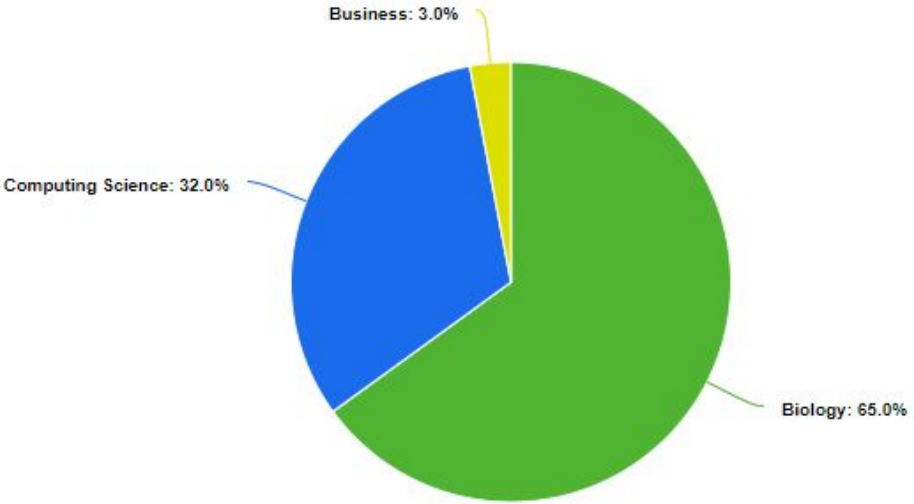
- Administrative
- Demographic
- Hospital records
- -omics
- Imaging
- Clinical trials

Techniques Used

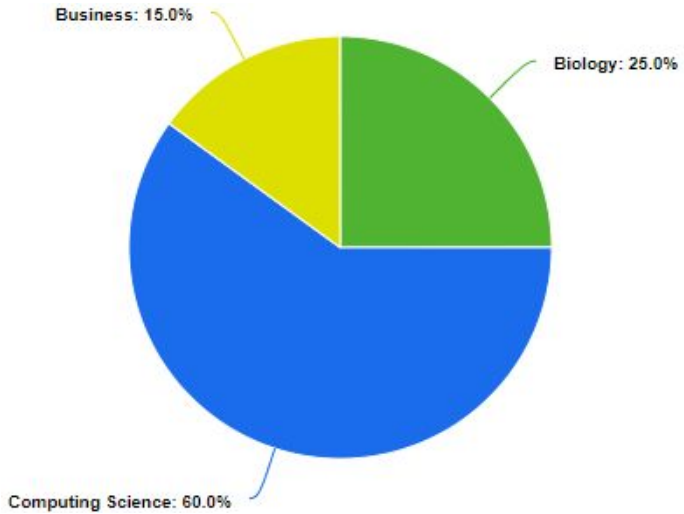
- Data cleaning
- Literature search
- Statistics
- Machine learning/AI
- Cloud computing
- Data visualization

Goal: Extract useful insights that can help improve medicine in some way!

What's so great about this field?



Me in Undergrad



Me Now

Doctors go back to school to learn the business of medicine

by Joanne Finnegan | Mar 5, 2020 10:00am



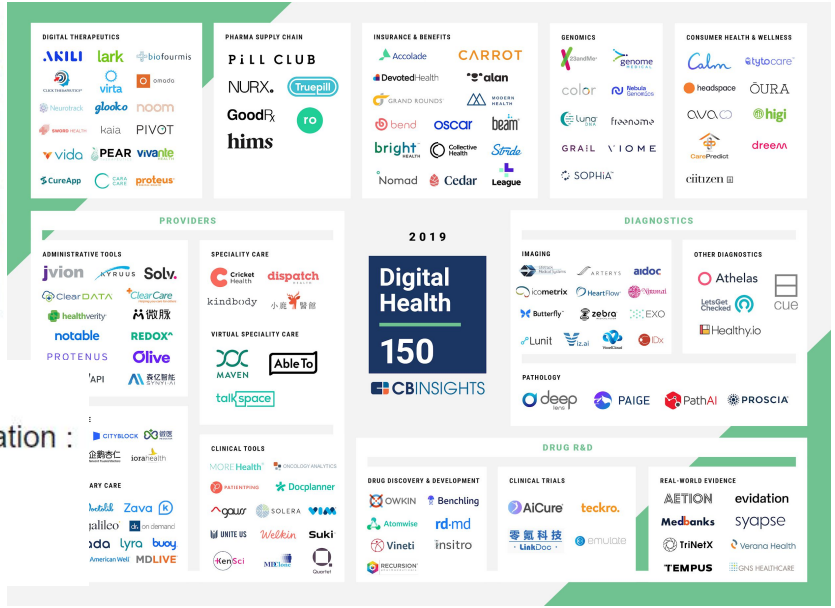
Doctors are going back to school to learn about the business of medicine. (Wavebreakmedia)

Clinisys



Improving Efficiency and Accuracy with AI in Healthcare

DRUGBANK



MEDO AI

NANOSTICS PRECISION HEALTH

Article

Artificial Intelligence-Based Resource Allocation : Applications in Ultradense Networks

October 2019 · IEEE Vehicular Technology Magazine PP(99)

DOI: 10.1109/MVT.2019.2938328

Skills/Techniques I Use Often



Technical Skills

Python!!! (+ NumPy, Pandas, SKLearn, etc.)



Jupyter notebook / Google Colab

Data visualization

Smart coding***

Soft Skills

Simplifying and explaining concepts

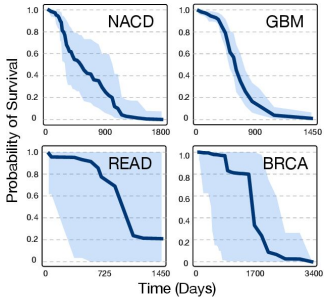
Presenting/public speaking (3-10 people)

Willingness to learn!

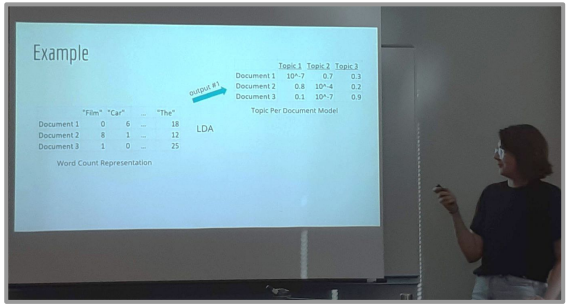
Past/Present Projects

Cancer Topic Modelling

with Dr. Russ Greiner



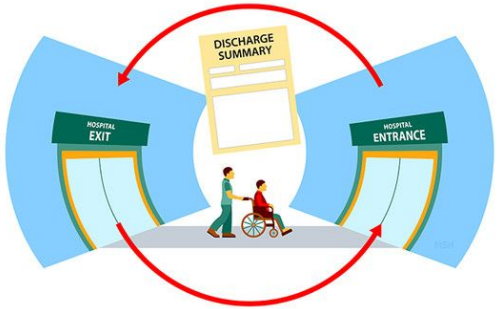
- Genetic data is HUGE (~25000 columns)
- We used LDA (latent Dirichlet Allocation) to reduce cancer data to 40 columns
- Machine learning to predict survival time, age, cancer severity
- Improved computational efficiency, very little information loss



Hospital Readmission Prediction

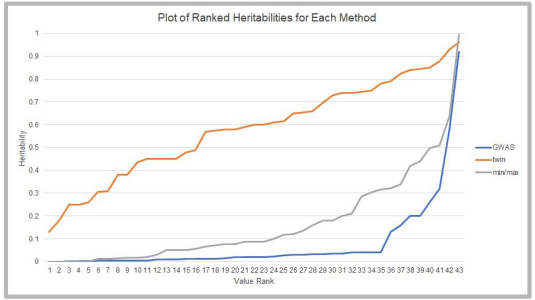
with Dr. Ilbin Lee

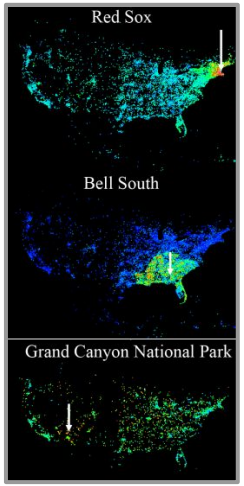
- How can we use a series of medical events to predict emergency hospital readmission?
- Use NLP (natural language processing), treat a patient's medical records as a "sentence"
- Word2Vec + GRU-RNN allows us to represent sentences (patients) as vectors
- Best ML result → AUC 0.82

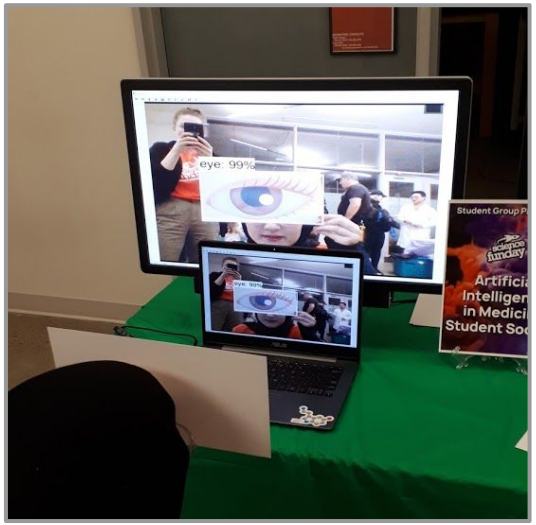


Misc. Projects

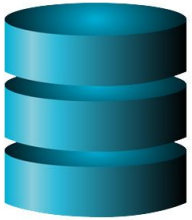
1. Organ image classification
2. Data-driven disease heritability estimation
3. Predicting covid outbreaks using Twitter data
4. Predicting mask wearing using sociodemographic factors





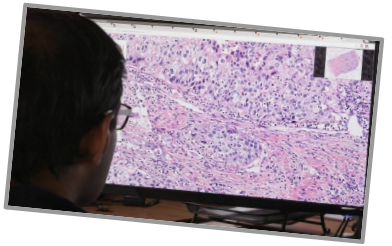


Topics Relevant to Precision Health





- Statistical machine learning and deep learning for data mining
  - Mathematics as it relates
- Data storage, management, retrieval, and transformation
- Computer vision and image recognition
- Natural language processing
- Engineering (electrical, mechanical, computer, biomedical)
- Explainable/interactive AI



Takeaways

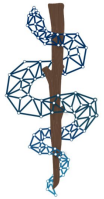
Medical Data Analysis is:

1. An interesting R&D project area
2. Very interdisciplinary (data/computer science, medicine, operations mgt.)

and:

3. The skills are transferable!

Shoutouts / Events



Artificial Intelligence in Medicine Student Society

- AIMSS (AI in Medicine Student Society)
  - linktr.ee/aimss
  - Workshop for Google Colab Oct 13th
    - Intro to cloud computing, connecting GDrive to Colab, implementing simple ML model
- New student group: SMLB (Students for Machine Learning in Business) smlb.org

Stay in Touch!

Email: sdavis1@ualberta.ca
LinkedIn: linkedin.com/in/arahdavi
Twitter: @arahdavi
AIMSS: linktr.ee/aimss

Chat with me about my work, AIMSS, research, grad school, etc.

